

MML TM 94-06

COLLOCATED TUNABLE WAVENUMBER SENSOR/ACTUATORS FOR SMART STRUCTURES

N00014-92-C-0214

CDRL A001.17

Covering the period: 1 February to 28 February 1994

Accesion For

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Justification

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Availability Codes

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Special

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Submitted to:

Office of Naval Research Scientific Officer Code: 1221

Submitted by:

K. Bridger L. Jones

MARTIN MARIETTA CORPORATION

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March 8, 1994

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Approved for pucinc released Distribution Unitaritied

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Contract progress and activities since CDRL A001.16.

Summary of progress

- One actuator module from the last burnout was sintered. It is intact but has some minor cracks. Three
 other actuators (two with Pt electrodes and one with Au/Pt/Pd electrodes) were burned out and are ready
 to be CIPped and sintered.
- Another batch of tape was cast with a 36% volume fraction of binder. Two actuators were made and put into burnout.
- An actuator (6-65-1) was tested at 3000 psi (to 0.8 MV/m) over the temperature range (-10°C to 40°C). At 5°C, the average strain of the actuator was 460 µstrain.

Telephone calls, trips, and significant results

 Bridger briefed Commander Colvert (PEO, AAASMP) on the use of PMN in transducers. Data from this contract were included and acknowledged.

Results bearing on prior problem areas

None

Programmatic changes

None

Technical or scheduling problem areas

• There was a slight delay in CIPping the large actuators due to a problem with the bags leaking during CIPping. The problem was addressed and should be resolved following receipt of larger CIPping bags.

Contract and cost schedule status

- Expended funds as of 28 February 1994, including expenditures prior to 23 July, were \$232K against a current budget of \$250K.
- A revised cost schedule, beginning at the 23 July program restart, and reflecting the \$114K funding gap
 is attached.

Plans for March 1994

- The three actuator modules from the last burnout will be CIPped and then sintered at a slower rate (10°C/min to 900°C, 5°C/min to 1200°C, 3 hour hold, 1°C/min to 500°C).
- The two actuator modules in burnout will be CIPped and sintered (the sintering schedule may be modified based on the results of the next sintered modules).

Preparers

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SCHEDULE, MILESTONES, AND DELIVERABLES -- Updated March 5, 1994

Phase I	1993						1994					
	J	Α	S	0	N	D	J	F	М	Α	М	J
CONTRACT START	•											
Task 1: Materials Preparation and Device Design												
Purchase additional starting materials	4											
Formulate ceramic materials												
Materials characterization		ı					,					
Model									~	}		
Task 2: Module Fabrication												
Prepare multilayer devices									◇			
Burnout, isopress, and fire devices						5				>		
Polish and terminate devices										^		
Task 3: Device Testing												
Initial electrical characterization							5					
Initial mechanical characterization						L					ightharpoons	
Force/displacement versus field and prestress									7			,
Strain versus field									_		\rightarrow	
• (Hipotting)						<u></u>						->
Reliability testing (extended cycling)					C							→
Final "proof" characterization												⊸
DELIVERABLES												
REPORT												<u></u>
	J	Α	S	0	N	D	J	F	М	Α	M	J 7

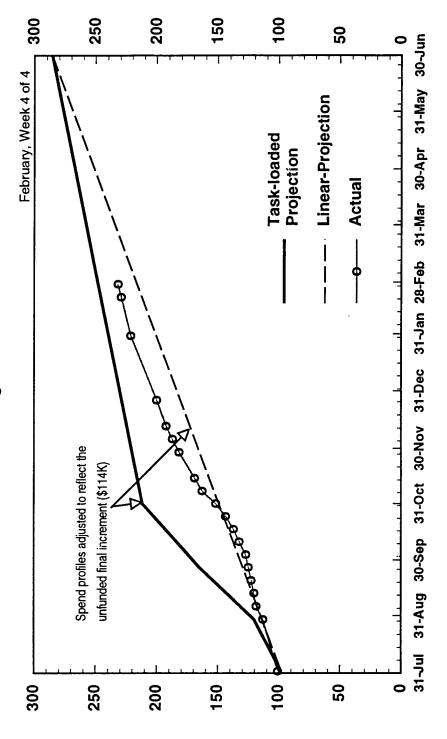
KEY:	
Milestone: Planned task:	Δ
Completed task:	
Task with new projected completion:	· ·

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Mar 8, 1994

EXPENDITURE CHART

3117-000 ONR Co-Fired High-Force Actuators



AMOUNT EXPENDED (\$K)

AMOUNT EXPENDED (\$K)